CHAPTER 5
STARTUP AND ALIGNMENT
LESSON PLAN 5

METHOD:

Conference, demonstration, and practical exercise

TIME ALLOTTED:

3.0 hours

COURSE PRESENTED TO:

a. LAV-25 crews
b. Instructors
c. TAVSC personnel

TOOLS, EQUIPMENT, AND MATERIALS:

See Appendix A

PERSONNEL:

a. Primary instructor
b. Assistant instructor

INSTRUCTIONAL AIDS:

a. Overhead projector
b. Viewgraphs (Appendix D)

REFERENCES:

a. TM 08594A-12&P, Chapter 2
b. TM 9-6920-711-12&P-1
c. TM 08594A-10/1A

APPENDICES:

Appendix A. Tools, Equipment, and Materials
Appendix B. Safety
Appendix C. TDRS Memory Card Setup
Appendix D. Viewgraphs

5-1. INTRODUCTION. (5 minutes)

Note. Show Slide 1.

a. **Reason.** To achieve realistic and effective training with PGS, LAV-25 crews must be able to correctly start, align, and verify alignment of PGS to the LAV-25's turret weapons.

Note. Show Slide 2.

b. **Training Objective.** Given an operational LAV-25 with PGS installed, pre-mission checks and boresighting completed, the crew will demonstrate the following tasks:

(1) Conduct system startup IAW TM 08594A-12&P, Chapter 2, in preparation for alignment.
(2) Conduct system alignment IAW TM 08594A-12&P, Chapter 2, in preparation for training.
(3) Perform alignment verification of PGS.

c. **Procedure.** During this block of instruction we will cover startup and alignment of PGS in preparation for gunnery training. You will have an assistant instructor for the practical exercise portion of this lesson. You will use the appropriate TMs to align PGS.

5-2. CONFERENCE/DEMONSTRATION/PRACTICAL EXERCISES. (140 minutes)

Notes. 1. The primary instructor will release the student crews to their assigned assistant instructors for the practical exercise portion of this lesson.
2. Show Slide 3.

a. **Control Panel.** The control panel is the crew interface with PGS during training.

(1) **Control panel features.**

(a) Display screen for numerical and graphical presentation of results and information
(b) Four pushbuttons to interface/communicate with the system
(c) Slot for TDRS memory card
(d) Eject button for removal of memory card

Note. Show Slide 4.

(2) **Control panel functions.**

(a) Monitor and upload of ammunition. During training, ammunition can be monitored and uploaded (from hull to turret) by crew using the control panel.

(b) Result presentation. Firing results or target vehicle results can be presented to the crew either in numerical or graphic form.

(c) System alignment. PGS is aligned by the crew before training using the control panel.

(d) BIT and error presentation. When an error occurs, the control panel presents a pop-up menu with the error listed. The control panel also allows the crew manually to initiate BIT.

(e) Controller functions. The control panel allows the instructor, using a CGUN, to upload ammunition, set time, etc. during training without the use of the TDRS computer unit.

(f) Data storage. The TDRS memory card in the control panel contains firing and target vehicle application data and exercise events collected during training. The stored training exercise events can be retrieved for AAR with the TDRS computer unit.

Note. Show Slide 5.

(3) **Control panel menus.** The control panel display screen is divided into several areas that have different functions.

F = Main function modes
SF = Sub-function of selected main function mode
T = Text area
S = Selection

Note. Show Slide 6.

(4) **Pushbutton functions.**

Note. If a pushbutton is continuously pressed, a function will be repeated until pushbutton is released.

(a) ESC pushbutton.

1. Abort menus
2. Inhibits function or selection without saving data

(b) ENTER pushbutton.

1. Gives access to menus highlighted by cursor
2. Saves/accepts data

(c) DOWN/LEFT pushbutton.

1. Moves the cursor down or left in menus
2. Decreases value for data selected

(d) UP/RIGHT pushbutton.

1. Moves the cursor up or right in menus
2. Increases value for data selected

b. **Startup and Alignment.** This is the most important step in preparing PGS for operation. Poor alignment and startup will degrade performance and produce incorrect training results.

Note. Show Slide 7.

(1) **System startup.** Place vehicle MASTER SWITCH ON and turn turret power ON IAW TM 08594A-10/1A, paragraph 2-17. Power is now applied to PGS.

(2) **Built-in test (BIT).** A built-in test is automatically performed when the system is powered up. If there is an error within the system, it will be announced with the following indications:

(a) Pop-up screen on the control panel
(b) Sound indication on vehicle intercom
(c) Visual indications in retro detector units

(3) **System error.** If a system error appears in the control panel, do the following:

(a) Consult TM 08594A-12&P, Chapter 3, for troubleshooting procedure based upon the BIT indication provided on the control panel.

Warning. Ensure that vehicle MASTER SWITCH and turret power are OFF before connecting or disconnecting cables. Failure to follow this warning may result in injury or death to personnel if turret or 25 mm gun moves suddenly.

(b) Do not connect or disconnect PGS cables unless vehicle MASTER SWITCH and turret power are OFF.

5-2. CONFERENCE/DEMONSTRATION/PRACTICAL EXERCISES (Con't).

Note. Show Slide 8.

(4) **Alignment.**

(a) Alignment is the process where PGS is aligned to the LAV-25's turret weapons. This is done electrically/optically with the turret weapons set to a predetermined value.

(b) The following alignments must be performed before PGS training when 25 mm and coax weapons are to be fired.

Note. Show Slide 9a.

1. **Cant alignment.** Adjustment of the transceiver unit to match the actual trunion cant of the vehicle.

Note. Show Slide 9b.

2. **Laser alignment.** Alignment of the transceiver unit to the 25 mm and coax weapon system.

Note. Show Slide 10a.

3. **TBOS alignment.** Alignment of the TBOS system to LAV-25's day and DIM36TH sight.

Note. Show Slide 10b and 10c.

a. TBOS gunner alignment. Alignment of the AP, HE, and coax TBOS effects in M36 gunner's sight using alignment tee and dot.

1. Rotation (tee)
2. Up/Down (dot)
3. Left/Right (dot)

b. TBOS commander alignment. Alignment of the AP, HE, and coax TBOS effects in M36 commander's sight using alignment tee and dot.

1. Rotation (tee)
2. Up/Down (dot)
3. Left/Right (dot)

c. TBOS DIM36TH alignment. Alignment of the AP, HE, and coax. TBOS effects in DIM36TH sight using alignment dot.

1. Up/Down (dot)
2. Left/Right (dot)

Notes. 1. The primary instructor now releases the student crews to their assigned assistant instructors for the practical exercise portion of this lesson.
2. Each assistant instructor is to conduct a safety briefing for his small group IAW Appendix B.
3. Before applying power to PGS, verify that each crew has a TDRS memory card set up IAW Appendix C.

c. **Preparation Before Alignment.**

Note. Alignment can be performed from 200 to 4000 m, but 1000 m is the preferred range.

(1) Place a target panel as close to 1000 m as possible.
(2) Install a retro reflector unit in center of target panel.

Note. Ensure that only one retro reflector unit is visible in field of view. If more than one retro reflector unit can be seen, alignment may be incorrect.

(3) Position vehicle on level ground with gun over front of hull.

d. **Startup Procedure.** PGS starts automatically when power is applied.

(1) **Power on.** Switch vehicle MASTER SWITCH, turret power, and DIM36TH sight power ON IAW TM 08594A-10/1A, paragraph 2-17. PGS is now powered up.
(2) Set TURRET DRIVE LOCK to UNLOCKED position IAW TM 08594A-10/1A.
(3) **Built-in test (BIT).**

(a) When the power is applied to the system, an automatic BIT is performed. If an error is found, the intercom announces this and an error message is found on the control panel.

Note. If an error is discovered during the startup procedure, perform troubleshooting IAW Chapter 3 of TM 08594A-12&P.

(b) BIT is automatically performed when the simulator is powered up. BIT is conducted continuously until power is switched off.

(c) After completion of a successful BIT, data from the TDRS memory card is downloaded into the system. A pop-up screen informs the operator when data is being downloaded.

e. **Setup of Control Panel.** The control panel display screen can be adjusted for different light conditions. To adjust, select the main function SU with up or down arrows and press ENTER.

(1) **Backlight adjustment.** Select BL and press ENTER. Use left or right arrows to switch backlight on or off. Save setting with ENTER.
(2) **Contrast adjustment.** Select CO and press ENTER. Use left or right arrows to increase or decrease contrast of display. Save setting with ENTER.

f. **Alignment.** To access the alignment menu for 25 mm gun and coax weapons, select AL (alignment) and press ENTER. A series of help text screens appear on control panel.

(1) **Vehicle setup during alignment.**

(a) Place DRIVE SELECT LEVER in POWER position.
(b) Select MAIN, HE, and SS on the gunner's hand control and verify that appropriate lamps illuminate on control display assembly (CDA). Press ENTER on control panel to continue.
(c) Set WEAPONS ARM to ARM.
(d) Set DIM36TH sight to NARROW FOV.

(2) **Cant alignment.** Cant alignment aligns the cant of the transceiver unit with the cant of the vehicle.

(a) Select CA (Cant Alignment) and press ENTER.
(b) Follow the help text screens on control panel.

(1) While monitoring control panel, rotate turret manually until CANT=indicates maximum value. Cant angle readout will increase or decrease as turret is rotated to left or right.
(2) While monitoring azimuth indicator, rotate turret left or right 1600 mils from position of maximum value.
(3) Unlock and rotate transceiver unit until control panel displays cant angle of 0 ± 0.5. Press ENTER.
(4) Carefully raise transceiver unit locking lever to locked position.
(5) Press ESC.

(3) **Laser alignment.** Laser alignment aligns the LAV-25's line of sight (LOS) for the 25 mm and coax weapon systems with the transceiver unit's LOS.

Notes. 1. Laser alignment can be performed from 200 to 4000 m, but 1000 m is the preferred range.
2. Ensure that only one retro reflector unit is visible within field of view. If more than one retro reflector unit can be seen, alignment may be incorrect.
3. During this step, the gunner aims at the retro reflector unit, not the center of the panel target.

(a) Select LA (laser alignment) and press ENTER.
(b) Using the gunner's hand control, lay the *boresight cross* of the 25 mm on the center of the retro reflector unit mounted on target panel.
(c) Select R (reset) and press ENTER to reset old laser alignment values.
(d) Select M (measure) and press ENTER. This activates the first laser alignment measurement.
(e) Press ENTER a minimum of three times to allow PGS to calculate an average value of the alignment measurements.
(f) Select S (save) and press ENTER to save alignment.
(g) Press ESC.

(4) **TBOS gunner alignment.** This is the alignment of the AP, HE, and 7.62 mm visual effects into the gunner's M36 day sight.

Note. Demonstrate to each student how the TBOS reticle is positioned on the 25 mm/coax reticle when aligned correctly.

(a) Look through the gunner's sight.
(b) Select a target with a dark background to allow for better observation of TBOS effects.
(c) Set TG (TBOS gunner alignment) and press ENTER.
(d) Adjust focus on TBOS eyepiece unit until reticle is sharp.
(e) Select R (Reset) and press ENTER to remove old alignment values.
(f) Select AL (Align TBOS) and press ENTER to start.
(g) Perform rotation alignment. Rotate TBOS alignment tee until aligned with reticle using up/down arrows. The TBOS alignment tee is properly positioned when horizontal and vertical lines of alignment tee and boresight cross are parallel and center line of alignment tee is pointing at bottom of sight.
(h) Press ENTER to continue.
(i) Perform elevation alignment. Using up/down arrows, adjust position of TBOS dot until dot is level with boresight cross.
(j) Press ENTER to save and continue.
(k) Perform azimuth alignment. Using left/right arrows, adjust position of TBOS dot until dot is in the center of the boresight cross.
(l) Press ENTER to save.

Note. After ENTER is pressed, the TBOS alignment reticle is displayed (tee with dot). If not properly aligned with sight reticle, repeat steps (e) through (l).

(m) Press ESC.

(4) **TBOS commander alignment.** This is the alignment of the AP, HE, and 7.62 mm visual effects into commander's M36 day sight.

(a) Look through commander's day sight.
(b) Select a target with a dark background to allow for better observation of TBOS effects.
(c) Select TC (TBOS commander alignment) and press ENTER.
(d) Adjust focus on TBOS eyepiece unit until reticle is sharp.
(e) Select R (Reset) and press ENTER to remove old alignment values.
(f) Select AL (Align TBOS) and press ENTER to start.
(g) Perform rotation alignment. Rotate TBOS alignment tee until aligned with reticle using up/down arrows. The TBOS alignment tee is properly positioned when horizontal and vertical lines of alignment tee and boresight cross are parallel and center line of alignment tee is pointing at bottom of sight.
(h) Press ENTER to continue.
(i) Perform elevation alignment. Using up/down arrows, adjust position of TBOS dot until dot is level with boresight cross.
(j) Press ENTER to save and continue.
(k) Perform azimuth alignment. Using left/right arrows, adjust position of TBOS dot until dot is in the center of the boresight cross.
(l) Press ENTER to save.

Note. After ENTER is pressed, the TBOS alignment reticle is displayed (tee with dot). If not properly aligned with sight reticle, repeat steps (e) through (l).

(m) Press ESC.

(5) **TBOS DIM36TH.** This is the alignment of the AP, HE, and 7.62 mm visual effects into DIM36TH sight.

(a) Select TD (TBOS DIM36TH alignment) then press ENTER.
(b) Select R (Reset) and press ENTER to remove old alignment values.
(c) Select AL (Align DIM36TH) and press ENTER.

Note. Rotation is not performed for the TBOS DIM36TH alignment.

(d) Perform elevation alignment. Using up/down arrows, adjust the position of the TBOS dot until dot is level with reticle aiming point.
(e) Press ENTER to save and continue.

5-2. CONFERENCE/DEMONSTRATION/PRACTICAL EXERCISES (Con't).

(f) Perform azimuth alignment. Using left/right arrows, adjust the position of the TBOS dot until dot is in the center of the reticle aiming point.
(g) Press ENTER to save.

Note. After ENTER is pressed, the TBOS alignment dot is displayed. If not properly aligned, repeat steps (b) through (g).

(h) Press ESC.

g. **Alignment Verification.** After completing PGS alignment procedures, verify that the alignment is correct.

(1) **Verification AP.** Fire an AP round at the retro reflector unit used for alignment. Verify that TBOS effect and hit results are correct.
(2) **Verification HE.** Fire an HE round at the retro reflector unit used for alignment. Verify that TBOS effect and hit results are correct.

Note. A target positioned within 1100 m of the LAV-25 must be used to register a coax hit. Tracer burnout will be at 900 m.

(3) **Verification COAX.** Fire coax rounds at retro reflector unit used for alignment. Verify that TBOS effect and hit results are correct.

5-3. FINAL REVIEW. (5 minutes)

a. **Student Questions.**

Note. Show Slide 11.

b. **Summary of Main Teaching Points.**

(1) Startup procedures.
(2) System alignment.
(3) Alignment verification.

Note. Show Slide 12.

c. **Closing Statement.** To achieve the desired training result with PGS, the correct startup, system alignment, and alignment verification of PGS to the LAV-25's turret weapons must be established.

APPENDIX A
TO LESSON PLAN 5

STARTUP AND ALIGNMENT

TOOLS, EQUIPMENT, AND MATERIALS

Listed equipment is one per vehicle crew, except as noted.

1. LAV-25 with PGS installed
2. TM 08594A-12&P
3. Boresight panel or target panel with retro reflector unit (one per class)
4. TDRS memory card programmed IAW Appendix C
5. TDRS computer unit
6. Training area with a minimum of 1000 m of maneuver space

APPENDIX B
TO LESSON PLAN 5

STARTUP AND ALIGNMENT

SAFETY

The general safety regulations below must be followed during the performance of this lesson. All safety regulations outlined in TM 08594A-10/1A must be strictly followed.

1. Mount and dismount the vehicle over left-front or through the back hatch.
2. Maintain three (3) points of contact while on top of the vehicle.
3. Follow unit SOP on smoking near vehicle.
4. Do not go over or under gun barrel.
5. Ensure that TURRET DRIVE LOCK is set to LOCKED.
6. Set vehicle MASTER SWITCH OFF.
7. Turn turret power OFF IAW TM 08594A-10/1A, paragraph 2-56.
8. Ensure that AP and HE feed shaft stop knobs (located on left side of main gun feeder) are pushed IN before training. When knobs are out, they can snag and damage electrical cables may be snagged causing damage to vehicle fire control system.
9. No cables should be connected or disconnected by untrained personnel.

APPENDIX C
TO LESSON PLAN 5

STARTUP AND ALIGNMENT

TDRS MEMORY CARD SETUP

The TDRS memory card used for the practical exercise (PE) part of this lesson has been set up with the following data. Each crew is given a card before the PE portion of class.

Application:	PGS LAV v1.1
Range:	Select being range used
New Ammo:	Yes
First Insert Only:	No
Main Weapon:	
AP Turret:	60 rounds
HE Turret:	150 rounds
AP Hull:	120 rounds
HE Hull:	300 rounds
Load Time:	0 seconds
Upload Time:	10 seconds
COAX Weapon:	
7.62 Turret:	400 rounds
7.62 Hull:	1200 rounds
Upload Time:	10 seconds
Exercise type:	Panel gunnery
Tracer:	
Tracer on:	Yes
Burst on:	Yes
Obscuration:	0 seconds
Presentation:	
Audio:	Yes
Control Panel Presentation:	Yes
Firing:	Full scale
Dispersion:	No
User Data:	Input crew data

APPENDIX D
TO LESSON PLAN 5

STARTUP AND ALIGNMENT

VIEWGRAPHS